

that it would be eminently desirable to have in each of our older universities the very simple and moderate accommodation attached to their botanic gardens which is needed, if only for giving students an opportunity of going over for themselves biological phenomena so fundamental in their general character and so comparatively easy to investigate.

THE SECOND GERMAN ARCTIC EXPEDITION

The German Arctic Expedition in 1869-70, and Narrative of the Wreck of the "Hansa" in the Ice. By Capt. Koldewey, Commander of the Expedition, assisted by members of the Scientific Staff. With numerous Woodcuts, two Coloured Maps, two Portraits on Steel, and four Chromolithographic Illustrations. Translated and Abridged by the Rev. L. Mercier, M.A. Oxon; and edited by H. W. Bates, F.L.S., Assistant Secretary, R.G.S. (London : Sampson Low and Co., 1874.)

THIS well-told and extremely interesting narrative of the fruitful German expedition to East Greenland in 1869-70 strongly confirms what we have said in our leading article with regard to the necessity of Government undertaking arctic exploration in order that it may be carried on with the greatest efficiency, the wisdom of choosing the route by Smith's Sound, and the valuable results that may be looked for from an expedition organised on a broad and liberal basis and carried out in a thoroughly systematic manner.

This expedition was initiated at Bremen shortly after the return of the first German Arctic Expedition, by Dr. Petermann, Capt. Koldewey, and a few others who are eager to advance the exploration of the polar regions, the object being to penetrate into the still unknown heart of these regions, making the east coast of Greenland the basis of operations. An elaborate plan of exploration was drawn out, which included the solution of nearly all the questions with respect to the arctic regions that yet remain unsolved. The funds were to be raised by public subscription, and the large committee of eminent scientific men who undertook the organisation of the expedition worked enthusiastically to get it set afloat. The scheme was well received by the German public. It was calculated that the whole expenses of the expedition would amount to 10,500*£*, and we are glad to see that all this was obtained, and even additional expenses paid off after the return of the expedition.

As might be surmised, this sum was adequate for only a modest expedition ; it is calculated that our Government expedition will cost at least six times that amount. Two small vessels were procured to carry the members of the expedition, the *Germania* and *Hansa*, the latter to act as tender to the former. The *Germania* was built expressly for the purpose, was a small two-masted screw steamer of 143 tons burden, thoroughly well sheathed and adapted for ice-navigation ; for a ship of its size, indeed, it could hardly have been better fitted than it was to struggle with all the dangers of ice-navigation. The *Hansa* was a schooner of 76*2/4* tons burden, which had been built in 1864 ; as she was to act as tender to the *Germania*, she does not seem to have been so strongly armed as the

latter. The internal fittings, provisioning, and general equipment were all that could be desired, considering the modest sum with which the organisers had to work.

The commander of the expedition was Capt. Koldewey, thirty-two years of age, an experienced arctic navigator and an enthusiast for arctic exploration, who by scientific study had added to his practical qualifications for the command of such an expedition ; Capt. Hegemann ruled on board the *Hansa*. The narrative of the expedition contains a brief sketch of the career of each of the scientific members of the expedition, all of whom seem to have been well qualified for their particular work. Physics, astronomy, botany, zoology, geology, and geodesy each had its representative, and on the whole we are bound to say the interests of each department were well cared for. One of the most efficient and hardest working members of the expedition was Lieut. Julius Payer, then twenty-seven years old, and 'now so famous in connection with the successful Austro-Hungarian expedition. There was an Englishman on board, Dr. Copeland, who, along with Dr. Börgen, undertook astronomical and physical science, as well as geodesy. Dr. Pansch was well qualified to look after the botany ; and Prof. Dr. Laube, of Vienna, was zoologist on board the unfortunate *Hansa*. Still, the narrative must forcibly impress any careful reader with the idea that the scientific staff was far from adequate for the work of thorough arctic exploration ; officers and men worked heart and soul to carry out the objects of the expedition, and the results obtained are well worth the money expended ; but at almost every step it was evident that the work was greatly hampered for want of men.

The two ships, with well-assorted crews and crews, left Bremerhaven on June 15, 1869, in presence of his Majesty the King of Prussia, who showed the warmest interest in the expedition. They went joyously on their journey, everyone on board in excellent spirits, the scientific staff making what observations were possible on the life and temperature in sea and air. This part of the narrative, as indeed the whole story of the expedition, is told with a most charming simplicity and freshness, which has been well kept up in the English abridged translation. The solitary and rugged Jan Mayen was sighted on July 9, but the almost eternal mist forbade any attempt at landing. Both *Germania* and *Hansa* struck the ice on July 15, the former in 74° 47' N. lat. and 11° 50' W. long., and the latter in 74° 57' N. and 9° 41' W. The two ships had lost sight of each other on July 10, and did not meet again till the 18th, keeping in sight of each other among the ice till the 20th. On that day the *Germania* signalled to the *Hansa* to come within hail, which unfortunately Capt. Hegemann misunderstood, and kept further off ; the two ships did not meet again. Up to this time they had been sailing northwards, mostly in dense fogs, trying to find an opening through which they might penetrate through the ice-line, so as to get as near the land as possible. As no favourable opening could be found, the ships turned southwards, agreeing to meet at Sabine Island. Shortly after the *Hansa* got caught among the ice, with which she continued to struggle heavily, and by August 14 was hopelessly involved in the impenetrable masses. From this time she was at the mercy of the ice, with which she drifted south until Oct. 21, when, in 70° 52' N. and 21° W., she was crushed between the heavy

floes and sank. Happily, those on board had for some time before begun to fear the worst, and transferred from the *Hansa* to a large floe a considerable proportion of the movables on board, including three good boats. They were, indeed, more fortunate than the nineteen people belonging to the *Polaris*, who found themselves in a similar position, very inadequately provided for. The men of the unfortunate *Hansa* proceeded to make themselves as comfortable as possible on their drifting island of ice, which at first was about seven miles in circumference. Among the stores which were transferred to the ice was a large quantity of coal in well-squared blocks, with which a wonderfully comfortable house was built, surrounded by a sort of snow wall, the space between which and the

house was covered over. The story of the life of the *Hansa*'s crew on their drifting floe is very well told; and although of course they were not quite so comfortable as if they were sailing in a good ship on a sunny sea, still their hardships appear to have been by no means great—not so great, we think, as those which the officers and crew of the *Germania* had to undergo in carrying on the work of the expedition. No one seems to have been seriously affected in health by the journey, and all kept in wonderfully good spirits. The floe occasionally came to grief, and its dimensions became gradually diminished; in January it suffered such a terrible break-up that a new house had to be built. Neither officers nor men—fifteen in all—gave themselves

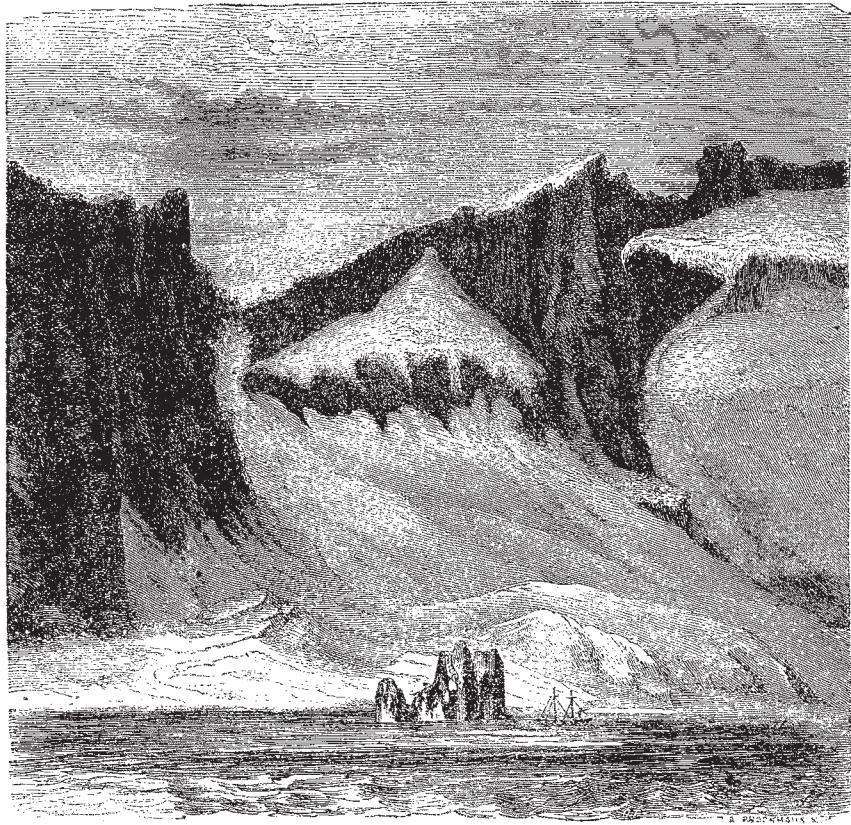


FIG. 1.—Regenerated Glacier in Franz-Joseph's Fjord.

up to idleness; observations were being continually made, and this part of the narrative will be found to contain a good deal of valuable information as to the fauna and flora met with, the state of the ice, the currents, and on the geographical and geological features of the land. At last, on May 7, in $61^{\circ} 12' N.$, the company quitted the floe and took to the boats, after having been on the former for 200 days. Even then it was not all plain sailing, as they had often to stay for days on floes, dragging the boats after them. At last, however, they got fairly away, and on June 13 reached the Mission Station of Friedericksthal, near the south point of Greenland, in $60^{\circ} N.$ lat., eight months after their little ship went down about 700 miles further north. It is needless to say the fifteen men were most hospitably entertained by the good missionaries.

After staying here a short time they went by Lichtenau to Julianshaab, a town further up the west coast of Greenland. Here they were taken on board a ship bound for Copenhagen, which, after visiting Frederickshaab, still further north, started for Europe about the end of July, and landed them in Copenhagen on Sept. 1. During the stay of the *Hansa*'s crew in the south-west of Greenland, the officers made many valuable observations on the people and the geology of the country. The natives in these parts are very different in *physique* from those on the west coast, as well as from those who live much further to the north; they bear on their features the unmistakable marks of a large infusion of European, mainly Danish, blood, and in their habits they are altogether more civilised than the genuine aborigines. Dr. Laube

was indefatigable in his investigations on all points of scientific interest, and geographers and antiquaries will be delighted with the latest information respecting the remains of the first Norse colonists, the European discoverers of Greenland ; an illustration is given of what are supposed to be the ruins of Erik Randa's house.

It would be impossible, within the limits of a review, to give any adequate idea of the work of the more fortunate *Germania*. After sailing about among the ice till the 5th of August, she dropped anchor in a small bay on the south of Sabine Island, in about $74\frac{1}{2}$ ° N., which was ultimately to be her winter harbour. From here an attempt was made to advance northwards, but the task was given up as hopeless, after repeated attempts and the most anxious observation and consultation, and the *Germania*

never got further north than $75\frac{1}{2}$ °. The ship returned to its first anchorage on the south side of Sabine Island, where she remained from Sept. 13, 1869, to July 22, 1870. The position chosen was a well sheltered one, both on the north and south, and although subjected to fearful storms the stout little steamer bravely weathered the long winter, and left Greenland with nothing wrong but a leaky boiler. The officers and crew seem to have been as comfortable as they could be on board a ship of the *Germania*'s accommodation, and nearly the whole winter through they were kept pretty regularly supplied with fresh meat, as the district around abounds with musk-oxen, reindeer, hares, foxes, not to mention seals, fish, and feathered fauna. An observatory was established on shore, and a valuable series of meteorological and magnetic observ-



FIG. 2.—Group of Esquimaux.

tions made, as well as observations on the tides and currents. Several sledge journeys were organised in autumn, spring, and summer ; and notwithstanding the great hardships from which those who went on these journeys suffered, from insufficient sledges, want of draught dogs, inadequate shelter, insufficient food, and generally deficient equipment, as well as from the wretched state of the ground, so unfavourable to sledge travelling, a wonderful amount of scientific work was accomplished between Cape Bismarck on the north, a little south of the 77th parallel, and the magnificent inlet discovered by the expedition, which indents the coast a little north of 73°, and which has been named Kaiser Franz-Joseph's Fjord. Anyone who compares the map of this stretch of coast which accompanies the volume with previous maps of Greenland will see at once

that our geographical knowledge of the East Greenland coast has been largely added to as well as corrected by the expedition. The mountain scenery and glaciers of this stretch of coast are very grand, and attain almost Alpine dimensions and magnificence in the many-armed Franz-Joseph Fjord. Lieut. Payer gives an admirable account of the scenery, geology, and glacial features of the latter, which is well helped out by the engravings and chromolithographs that illustrate his account. One peak, "a pyramid of ice," Payer calls it, rising 11,000 ft. above the sea far to the west of the Fjord, was named after the accomplished geographer Petermann.

But we cannot enter into details. Botanists will find plenty to interest them in these pages, as a very full account is given of the almost incredibly abundant flora of the region ; a whole chapter is devoted to an

account of the habits and appearance of the larger fauna, which is so plentiful that no expedition need suffer from want of food ; the geology of the coast and islands was well investigated, and coal was found to abound in some districts ; dredging also was occasionally carried on, but with no very fruitful results. Clavering, forty years ago, met with a considerable number of natives in this part of East Greenland ; not one is now to be found, though the remains of their huts, burial-places, weapons, and utensils abound. The map shows that careful and frequent soundings were taken, and the book contains some very valuable observations on the nature of the ice of these regions, and especially on the difference between the Greenland glaciers and those of the Alps. We find also that a spectroscopic examination was made of the deep blue light of the ice, the result of which is, however, not given. Indeed, those who want to obtain full details of the scientific results of this expedition must go to the original German account, as the English edition has evidently been mainly abridged by the omission of scientific details.

Altogether, the results of the second German Arctic Expedition are such as to reflect the very highest credit upon its members, and must be very gratifying to its promoters. There is yet much to be done ere the east coast of Greenland is adequately explored, and although this expedition has clearly proved that there is no road to the pole from that side, still there is undoubtedly on the east coast of Greenland a fertile field for further discovery. All this is admitted by Capt. Koldewey in his conclusion, and we coincide with him in believing that if an English expedition to West Greenland through Smith's Sound, and a German one to East Greenland, started at the same time, they would, with our present experience and means of assistance, certainly lead to very rich results. Happily, an English expedition on an adequate scale is being organised ; let the German Government emulate the liberality of ours, and send out an equally well-equipped expedition, to continue, if not to complete, the work of the *Germania* on the other side of Greenland. If it so please the Germans, let it be a race to the pole, and let Dr. Petermann be umpire.

The *Germania* left her winter-quarters on July 22, and after coasting about for some time—it was then the large Fjord was discovered—turned homewards, and reached Bremerhaven safely on Sept. 11.

The translation and editing are carefully done, and the numerous and well-executed illustrations add greatly to the value of the work, which well deserves a wide circulation.

DRAYSON'S "PROPER MOTION OF THE FIXED STARS," ETC.

The Cause of the Supposed Proper Motion of the Fixed Stars, and an Explanation of the Apparent Acceleration of the Moon's Mean Motion ; with other Geometrical Problems in Astronomy hitherto Unsolved. A Sequel to the Glacial Epoch. By Lieut.-Col. Drayson, R.A., F.R.A.S. (London : Chapman and Hall, 1874.)

THIS book, the author tells us, is a sequel to "The Cause, Date, and Duration of the Last Glacial Epoch," of which we published a short notice last year. The last work was founded on misconception and igno-

rance, and in this respect the one may fairly be called a sequel to the other. In our remarks on "The Glacial Epoch" we objected to the author's attempt to solve a problem in physical astronomy by geometry alone. The author, however, is unconvinced. His geometry, it is true, is a much more powerful instrument than anything of the same name which we have had the fortune to meet with so far. On p. 4 of the present work he thus compares the powers of observation and geometry :—“Mere observation can never arrive at any result until the whole cycle, and perhaps many cycles, have been observed. For example, if the sun's mid-day altitude were observed on the 1st of January of any year, and again on the 1st of February and 1st of March, observation alone could tell us nothing more than that there was a certain increase in this meridian altitude. Geometry, however, could analyse this rate of increase, and would probably be able to predict what would be the sun's meridian altitude for every day in the year.” Perhaps the author could, by his geometry, if he knew the height of the reviewer at the ages of ten, twelve, and fourteen, predict his height at the age of fifty or sixty. The geometry which could solve the one problem would surely be able to solve the other.

Lieut.-Col. Drayson is not only unconvinced ; he is unblushingly self-confident. On p. 33 we find : “When, then, it happens that the number of persons capable of judging independently of an original and difficult problem in geometrical astronomy, are to the number who are the mere blind followers of ‘authorities in science’ as about one to ten thousand, we find ourselves in a considerable minority.”

On the other hand, the amount of reliance which he places upon the intelligence of other persons is very slight, as may be seen from the following quotations :—

“To a person unacquainted with geometry there seems nothing unsound in stating that the centre of a circle can vary its distance from the circumference and yet still always remain the centre ; and this is the statement now put forward as correct by certain theorists.”

“In our work, ‘The Cause, &c., of the Glacial Epoch,’ we called attention to the fact that it seemed improbable that the centre of a circle could vary its distance from its circumference and yet remain the centre, although it had been agreed during nearly two hundred years that it could do so.”

Of course it would seem unsound, improbable, impossible, and absurd to anyone who had formed his ideas of a circle from Euclid's definition ; and to us it seems almost inconceivable that anyone can really believe or profess to believe, what the author here and in almost innumerable other passages in his books so confidently asserts, that this absurdity is taught or even thought of. The author certainly never proves that such is the case. The special views of Lieut.-Col. Drayson with reference to the movement of the axis of the earth in space we will let him state for himself :—

“It is here demonstrated that during 230 years we can calculate what the obliquity was to within one second ; that is to say, the actual curve traced by the pole of the heavens relative to the pole of the ecliptic during 230 years does not differ one second from the circumference of a circle having a radius of $29^{\circ} 25' 47''$, and its centre 6° from the pole of the ecliptic. In other words, the curve traced by the pole of the heavens during 230 years is part of a circle such as that defined above.”